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The Effect of Aerobic Fitness on Psychological Stress as Measured by Heart Rate Response During Academy Training in a Custody Assistant Recruit Population

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ABSTRACT

Custody Assistants (CAs) have a job that often will subject them to high levels of psychological stress. During performance of daily job tasks, CAs may encounter high anxiety situations and may need to make effective decisions under stressful conditions. One of the goals of academy training is to prepare CA recruits for stressful situations by subjecting them to high levels of psychological stress. Previous research has shown that aerobic fitness can potentially moderate the effects of high anxiety and stressful situations. Given the importance of decision making and stress tolerance in this population, research is needed to determine the physiological response to situations of high stress. **PURPOSE:** To determine the effect of aerobic fitness on the physiological response of CAs to a high stress situation on the first day of academy training using heart rate (HR) data. **METHODS:** Retrospective analysis was performed on data from one CA class of 26 recruits (15 males, 11 females). The session was designed to elicit an elevated stress response via verbal commands from training staff, with limited physical activity. HR data were gathered using HR monitors, and categorized (relative to age-predicted maximum HR; HRmax) according to American College of Sports Medicine (ACSM) guidelines (very light: <57% HRmax, light: 57%-63% HRmax, moderate: 64%-76% HRmax, vigorous: 77%-95% HRmax, very vigorous: >95% HRmax). Recruits were grouped into fitness ability levels based on their estimated maximal aerobic capacity from a 2.4-km run relative to ACSM general population age norms (Superior, Excellent, Good, Fair, Poor, Very Poor). Superior and Excellent categories were collapsed into High Fit (HF; n = 4); Good and Fair were combined into Moderate Fit (MF; n = 8); and Poor and Very poor were considered Low Fit (LF; n = 14). A one-way ANOVA ($p < 0.05$) was used to assess the differences in time spent in the various HR zones between the three fitness groups. **RESULTS:** The total time for the session was 75 minutes. There were no significant between-group differences on the time spent in the different HR zones or the percentage of total time spent in the different zones. Collectively, the three groups spent the largest percentage of total training time in the vigorous zone (HF = ~61.37%; MF = ~58.81%; LF = ~50.99%). This equated to 45, 44, and 33 minutes spent at a vigorous intensity for the HF, MF, and LF groups, respectively. **CONCLUSIONS:** These data suggested that a psychological stress session provided a similar intensity to a vigorous aerobic training session (as defined by ACSM). Aerobic fitness did not seem to significantly attenuate the physiological response to stress in this CA class, contrary to previous research. One potential reason for this is that 14/26 recruits (53%) were classified as having poor or very poor aerobic fitness. Individual recruits are seldom the sole recipient of consequences due to any mistakes made within the group. This may have meant that poorer fit recruits made errors that impacted the HR response of HF recruits. **PRACTICAL APPLICATIONS:** Law enforcement agencies should be aware of the aerobic fitness of their CA recruits, which was generally poor in this class. Further research is needed with a larger sample as the current class was relatively homogenous in its physical ability. In addition, more research is necessary to analyze specific decisions made under stress in relation to physical fitness.

INTRODUCTION

- Custody assistants (CAs) work in county lockups, detention centers, courthouses, and station jails. They have a job that can subject them to high levels of physical and psychological stress during the performance of their daily job tasks.³
- One of the goals of the academy setting is to physically and mentally prepare the recruits to perform their job tasks under stress similar to what they may experience in their occupation.
- Previous research has shown that aerobic fitness level can potentially moderate the effects of high anxiety and stressful situations.^{2,4} Considering the potential for situations of high physical stress combined with high psychological stress while working in custody, it is therefore important that recruits possess adequate aerobic fitness.
- The purpose of this research was to determine the effect of aerobic fitness on the physiological response of CAs to a high stress situation on the first day of academy using heart rate (HR) data.

METHODS

- Retrospective analysis was performed on data from one CA class of 26 recruits composed of 15 males (age = 23 ± 5 years, body mass = 81.55 ± 11.68 kg, height = 1.75 ± 0.56 m) and 11 females (age = 28.90 ± 6.99 , body mass = 66.65 ± 8.84 kg, height = $1.70 \pm .50$ m).
- The session was not designed as a physical training session; verbal commands from the staff, combined with limited physical activity, were used to elicit a stress response.
- The session was organized so that the recruits were split up into 3 platoons. Due to the platoon structure of the session, training staff would punish an entire platoon with relatively light physical activity such as holding a squat position or doing push-ups.
- HR data were gathered using HR monitors, and categorized (relative to age-predicted maximum HR; HRmax) according to American College of Sports Medicine (ACSM) guidelines (very light: <57% HRmax, light: 57%-63% HRmax, moderate: 64%-76%, HRmax, vigorous: 77%-95% HRmax, very vigorous: >95% HRmax).¹
- Recruits were grouped into fitness ability levels based on their estimated maximal aerobic capacity from a 2.4-km run relative to ACSM general population age norms.¹ The groups were defined as: Superior, Excellent, Good, Fair, Poor, and Very Poor. Superior and Excellent categories were further collapsed into a High Fit group (HF; n = 4); Good and Fair were combined into a Moderate Fit group (MF; n = 8); and Poor and Very Poor were considered Low Fit (LF: n = 14). This is shown in Figure 1.

- A one-way ANOVA ($p < 0.05$) was used to assess the differences in time spent in the various HR zones between the three fitness groups.

RESULTS

- The total time for the session was 75 minutes. There were no significant between-group differences on the time spent in the different HR zones or the percentage of total time spent in the different zones.
- Collectively, the three groups spent the largest percentage of total training time in the vigorous zone. HF spent 61.37% of the total session time in the vigorous zone; MF spent 58.81% of their total session time in the vigorous zone; and LF spent 50.99% of their total session time in the vigorous zone. This equated to 45, 44, and 33 minutes spent at a vigorous intensity for the HF, MF, and LF groups, respectively.
- Moreover, recruits collectively spent 13.2 ± 10.7 minutes above 95% of HRmax.



Figure 1. Number of recruits categorized by fitness levels.

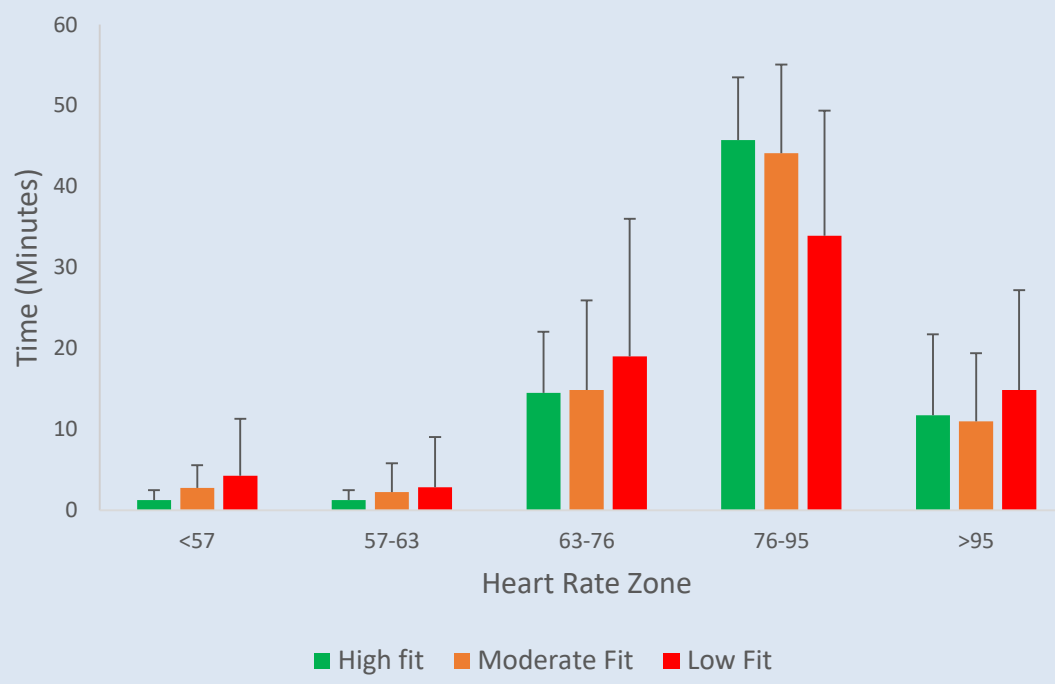


Figure 2. Total time spent (minutes) in each of the ACSM defined Heart Rate Zones for the High Fit, Moderate Fit and Low Fit groups of CA recruits.



CONCLUSION

- These data suggest that a psychological stress focused training session with limited physical activity can elicit a heart rate response similar to a vigorous aerobic training session as defined by the ACSM.
- Aerobic fitness as measured by the 2.4-km run was not found to have an attenuating effect on the physiological response to stress contrary to previous research.^{2,4} One study used a graded maximal aerobic cycling test to determine aerobic fitness and not a submaximal test.⁴ A graded aerobic test that incorporates an externally-paced maximal effort may be required to provide a more appropriate measure of aerobic fitness.
- Nonetheless, the class was homogenous in its physical fitness abilities with over half the class (14/26 recruits or 53%) having poor or very poor aerobic fitness. The structure of the session was such that a single recruit could be responsible for making a decision that caused the group they were in to receive more psychological stress; therefore, it is possible that the poorer fit recruits made errors that impacted the HR responses of the MF and HF groups.

PRACTICAL APPLICATIONS

- Psychological stress training sessions can elicit physiological responses equivalent to vigorous exercise sessions as defined by ACSM guidelines.
- Law enforcement agencies should be aware of the aerobic fitness levels of their CA recruits, which was considered relatively poor in this class. The homogeneity of fitness levels may have not allowed for adequate statistical power to have been realized due to the fewer members of the high fit group.
- Future research should attempt to use a maximal aerobic test such as the multi-stage fitness test as a measure of aerobic fitness as aerobic fitness measured by the submaximal 2.4-km run did not appear to attenuate physiological response to stress.

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